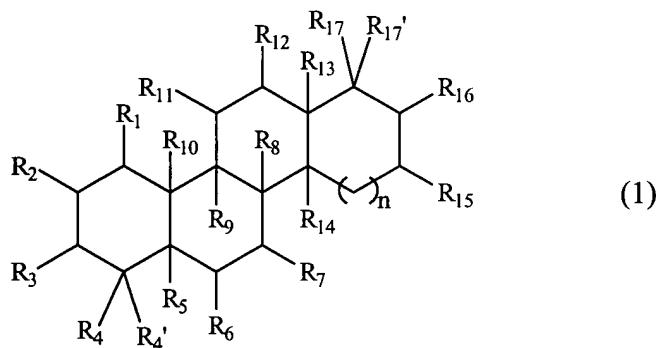


Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A compound of formula (1):



wherein

each of R₁, R₂, R₇, R₁₁, R₁₂, R₁₅, and R₁₆, independently, is hydrogen, hydroxy, amino, carboxyl, oxo, halo, sulfonic acid, -O-sulfonic acid, or alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid;

R₄ is hydrogen, hydroxy, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; or R₄ together with R_{4'} is oxo;

R_{4'} is hydrogen, hydroxy, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -

N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; or R₄, together with R₄ is oxo; each of R₁₇, and R_{17'}, independently, is hydrogen, hydroxy, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; R₃ is X-Y-, wherein X is hydrogen, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl; Y is -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-; R₅ and R₆, together, are -O-; or R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo; each of R₈, R₉, R₁₀, R₁₃, and R₁₄, independently, is hydrogen, alkyl, haloalkyl, hydroxyalkyl, alkoxy, hydroxy, or amino; and n is 0, 1, or 2; and provided that when R¹, R², R⁴, R^{4'}, R⁸, R⁹, R¹¹, R¹², R¹⁴, R¹⁵, R¹⁶, and R¹⁷ are hydrogen; R¹⁰ and R¹³ are CH₃; R⁵ and R⁶ together are a double bond between C-5 and C-6; R⁷ is hydrogen or oxo; R^{17'} is CH₃CH(CH₂)₃CH(CH₃)₂; and n is 0, then R³ is (CH₃CH₂)₃HN⁽⁺⁾OSO₂O- or X-Y- wherein X is hydrogen, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl; Y is -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -CO-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

2. (Original) The compound of claim 1, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

3. (Withdrawn) The compound of claim 1, wherein R₅ and R₆, together, are -O-.

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4. (Withdrawn) The compound of claim 3, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

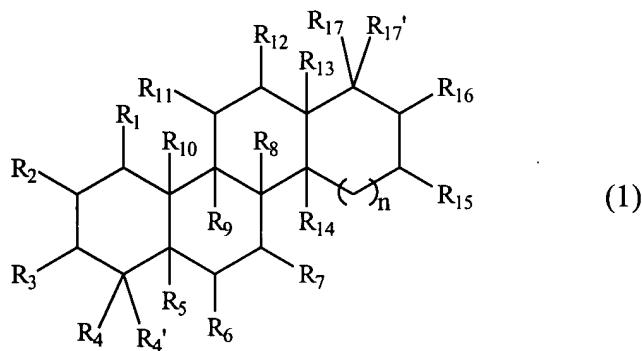
5. (Withdrawn) The compound of claim 4, wherein X is hydrogen, and Y is $-SO_3$.
6. (Withdrawn) The compound of claim 3, wherein $-O-$ is on the α side of C-5 and C-6.
7. (Withdrawn) The compound of claim 6, wherein X is hydrogen or amino, and Y is $-O-SO_2-$, $-SO_2-O-$, $-SO_3-O-$, $-CO-$, $-CO-O-$, $-O-CO-$, $-CO-NH-$, $-CO-N(alkyl)-$, $-NH-CO-$, or $-N(alkyl)-CO-$.
8. (Withdrawn) The compound of claim 7, wherein X is hydrogen, and Y is $-SO_3$.
9. (Withdrawn) The compound of claim 8, wherein R_1 , R_2 , R_4 , $R_{4'}$, R_7 , R_8 , R_9 , R_{11} , R_{12} , R_{14} , R_{15} , R_{16} , and R_{17} are hydrogen; and each of R_{10} , R_{13} , and R_{17} , independently, is alkyl.
10. (Withdrawn) The compound of claim 9, wherein the compound is 5α , 6α -epoxycholesterol-3-sulfate.
11. (Withdrawn) An antibody which is specifically against the compound of claim 10.
12. (Original) The compound of claim 1, wherein R_5 and R_6 , together, are a double bond between C-5 and C-6, and R_7 is oxo.
13. (Original) The compound of claim 12, wherein X is hydrogen or amino, and Y is $-O-SO_2-$, $-SO_2-O-$, $-SO_3-O-$, $-CO-$, $-CO-O-$, $-O-CO-$, $-CO-NH-$, $-CO-N(alkyl)-$, $-NH-CO-$, or $-N(alkyl)-CO-$.
14. (Original) The compound of claim 13, wherein X is hydrogen, and Y is $-SO_3-O-$.

15. (Original) The compound of claim 14, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen; and each of R₁₀, R₁₃, and R₁₇, independently, is alkyl.

16. (Cancelled)

17. (Withdrawn) An antibody which is specifically against the compound of claim 16.

18. (Withdrawn) A method of treating hypcholesterolemia, comprising administering to a subject in need thereof an effective amount of a compound of formula (1):



wherein

each of R₁, R₂, R₄, R_{4'}, R₇, R₁₁, R₁₂, R₁₅, R₁₆, R₁₇, and R_{17'}, independently, is hydrogen, hydroxy, amino, carboxyl, oxo, halo, sulfonic acid, -O-sulfonic acid, or alkyl that is optionally inserted with -O-, -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; R₃ is X-Y-, wherein X is hydrogen, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl; Y is -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-; R₅ and R₆, together, are -O-; or R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo; each of R₈, R₉, R₁₀, R₁₃, and R₁₄, independently, is hydrogen, alkyl, haloalkyl, hydroxyalkyl, alkoxy, hydroxy, or amino; and

n is 0, 1, or 2.

1

19. (Withdrawn) The method of claim 18, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

20. (Withdrawn) The method of claim 18, wherein R₅ and R₆, together, are -O-.

21. (Withdrawn) The method of claim 20, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

22. (Withdrawn) The method of claim 21, wherein X is hydrogen, and Y is -SO₃-O-.

23. (Withdrawn) The method of claim 20, wherein -O- is on the α side of C-5 and C-6.

24. (Withdrawn) The method of claim 23, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO.

25. (Withdrawn) The method of claim 24, wherein X is hydrogen, and Y is -SO₃-O-.

26. (Withdrawn) The method of claim 25, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen, and each of R₁₀, R₁₃, and R₁₇, independently, is alkyl.

27. (Withdrawn) The method of claim 26, wherein the compound is 5 α , 6 α -epoxycholesterol-3-sulfate.

28. (Withdrawn) The method of claim 18, wherein R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo.

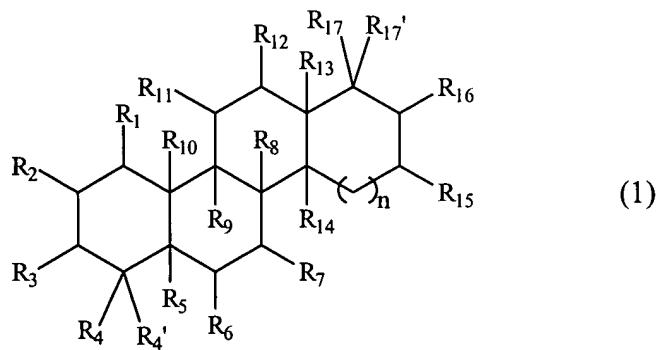
29. (Withdrawn) The method of claim 28, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

30. (Withdrawn) The method of claim 29, wherein X is hydrogen, and Y is -SO₃-O-.

31. (Withdrawn) The method of claim 30, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen, and each of R₁₀, R₁₃, and R_{17'}, independently, is alkyl.

32. (Withdrawn) The method of claim 31, wherein the compound is 7-keto-cholesterol-3-sulfate.

33. (Currently amended) A pharmaceutical composition comprising a compound of formula (1):



wherein:

each of R₁, R₂, R₇, R₁₁, R₁₂, R₁₅, and R₁₆, independently, is hydrogen, hydroxy, amino, carboxyl, oxo, halo, sulfonic acid, -O-sulfonic acid, or alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid;

R₄ is hydrogen, hydroxy, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; or R₄ together with R_{4'} is oxo;

R_{4'} is hydrogen, hydroxy, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; or R_{4'} together with R₄ is oxo;

each of R₁₇, and R_{17'}, independently, is hydrogen, hydroxy, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl that is optionally inserted with -NH-, -N(alkyl)-, -O-, -S-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid;

R₃ is X-Y-, wherein X is hydrogen, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl; Y is -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-;

R₅ and R₆, together, are -O-; or R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo;

each of R₈, R₉, R₁₀, R₁₃, and R₁₄, independently, is hydrogen, alkyl, haloalkyl, hydroxyalkyl, alkoxy, hydroxy, or amino; and

n is 0, 1, or 2; provided that when R¹, R², R⁴, R^{4'}, R⁸, R⁹, R¹¹, R¹², R¹⁴, R¹⁵, R¹⁶, and R¹⁷ are hydrogen; R¹⁰ and R¹³ are CH₃; R⁵ and R⁶ together are a double bond between C-5 and C-6; R⁷ is hydrogen or oxo; R^{17'} is CH₃CH(CH₂)₃CH(CH₃)₂; and n is 0, then R³ is (CH₃CH₂)₃HN⁽⁺⁾OSO₂O- or X-Y- wherein X is hydrogen, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl; Y is -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -CO-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-; and a pharmaceutically acceptable carrier.

34. (Original) The composition of claim 33, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

35. (Withdrawn) The composition of claim 33, wherein R₅ and R₆, together, are -O-.

36. (Withdrawn) The composition of claim 35, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

37. (Withdrawn) The composition of claim 36, wherein X is hydrogen, and Y is -SO₃-O-.

38. (Withdrawn) The composition of claim 35, wherein -O- is on the α side of C-5 and C-6.

39. (Withdrawn) The composition of claim 38, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

40. (Withdrawn) The composition of claim 39, wherein X is hydrogen, and Y is -SO₃-O-.

41. (Withdrawn) The composition of claim 40, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen, and each of R₁₀, R₁₃, and R_{17'}, independently, is alkyl.

42. (Withdrawn) The composition of claim 41, wherein the compound is 5 α , 6 α -epoxycholesterol-3-sulfate.

43. (Original) The composition of claim 33, wherein R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo.

44. (Original) The composition of claim 33, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

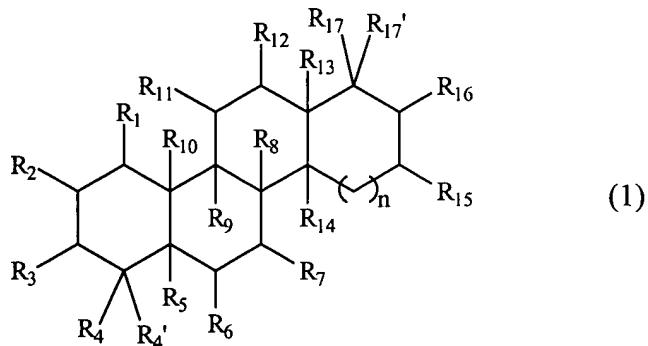
45. (Original) The composition of claim 44, wherein X is hydrogen, and Y is -SO₃-O-.

46. (Original) The composition of claim 45, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen, and each of R₁₀, R₁₃, and R₁₇, independently, is alkyl.

47. (Cancelled)

48. (Withdrawn) A method of evaluating a compound for its agonistic effect on an liver X receptor, comprising:

contacting the compound to be evaluated with the liver X receptor in the presence of a compound of formula (1):



wherein

each of R₁, R₂, R₄, R_{4'}, R₇, R₁₁, R₁₂, R₁₅, R₁₆, R₁₇, and R_{17'}, independently, is hydrogen, hydroxy, amino, carboxyl, oxo, halo, sulfonic acid, -O-sulfonic acid, or alkyl that is optionally inserted with -O-, -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-, and further optionally substituted with hydroxy, halo, amino, carboxyl, sulfonic acid, or -O-sulfonic acid; R₃ is X-Y-, wherein X is hydrogen, amino, carboxyl, halo, sulfonic acid, -O-sulfonic acid, or alkyl; Y is -S-, -NH-, -N(alkyl)-, -SO-, -SO₂-, -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-; R₅ and R₆, together, are -O-; or R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo; each of R₈, R₉, R₁₀, R₁₃, and R₁₄, independently, is hydrogen, alkyl, haloalkyl, hydroxyalkyl, alkoxy, hydroxy, or amino; and n is 0, 1, or 2; and

assessing the agonistic effect of the compound to be evaluated on the liver X receptor.

49. (Withdrawn) The method of claim 48, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

50. (Withdrawn) The method of claim 48, wherein R₅ and R₆, together, are -O-.

51. (Withdrawn) The method of claim 50, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

52. (Withdrawn) The method of claim 51, wherein X is hydrogen, and Y is -SO₃-O-.

53. (Withdrawn) The method of claim 50, wherein -O- is on the α side of C-5 and C-6.

54. (Withdrawn) The method of claim 51, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

55. (Withdrawn) The method of claim 54, wherein X is hydrogen, and Y is -SO₃-O-.

56. (Withdrawn) The method of claim 55, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen, and each of R₁₀, R₁₃, and R_{17'}, independently, is alkyl.

57. (Withdrawn) The method of claim 56, wherein the compound is 5 α , 6 α -epoxycholesterol-3-sulfate.

58. (Withdrawn) The method of claim 48, wherein R₅ and R₆, together, are a double bond between C-5 and C-6, and R₇ is oxo.

59. (Withdrawn) The method of claim 48, wherein X is hydrogen or amino, and Y is -O-SO₂-, -SO₂-O-, -SO₃-O-, -CO-, -CO-O-, -O-CO-, -CO-NH-, -CO-N(alkyl)-, -NH-CO-, or -N(alkyl)-CO-.

60. (Withdrawn) The method of claim 59, wherein X is hydrogen, and Y is -SO₃-O-.

61. (Withdrawn) The method of claim 60, wherein R₁, R₂, R₄, R_{4'}, R₇, R₈, R₉, R₁₁, R₁₂, R₁₄, R₁₅, R₁₆, and R₁₇ are hydrogen, and each of R₁₀, R₁₃, and R_{17'}, independently, is alkyl.

62. (Withdrawn) The method of claim 61, wherein the compound is 7-keto-cholesterol-3-sulfate.